

Semantic Web and Application in E-Commerce

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Abstract:

The web enables people to access documents and several services on the internet but today's methods requires human intelligence. The semantic web emphasize on the current web with a knowledge base and well formatted data that can be processed by computer. The semantic web is a vision of information that is understandable by computers, so that they can perform task involved in finding, combining, and acting upon information on the web. The main obstacle is the fact that the Web was not designed to be processed by machines. Although, web pages include special information that tells a computer how to display a particular piece of text or where to go when a link is clicked, they do not provide any information that helps the machine to determine what the text means. This makes semantic web a solution for the problem. This will enable computers to assist human users in tasks an understand data the way they can't do today. In present days users often want to use the Web to do more than just locate a

document, they want to perform some task. For example, a user might want to find the best price on a desktop computer, plan and book a vacation. Completing these tasks involves visiting a series of pages and comparing the content according to needs of user which is far beyond the capability of a traditional web page or search engine. This is the situation where semantic web comes in the picture.

Tim Berners-Lee, inventor of the Web, has coined the term Semantic Web to describe that Semantic Web is not a separate Web but an extension of the current one, in which information is given well-defined meaning, better enabling computers and people to work in cooperation.

1. Introduction:

With the development of World Wide Web more companies are updating their data in the web. In traditional web the search method for data is not only time consuming, but also results in many unrelated information. The

reason is, due to various data accessing methods and data description used in the traditional web. The semantic web overcomes all these drawbacks. Semantic web is not the replacement of current web but it is an extension of current web, in which information is given in a well-defined manner, so that it enable the computer and people to work in cooperation. This paper mainly focuses on the data description (Producer) and data accessing (Consumer) in e-commerce circumstances. In section 2, related terminologies and limitations in the current e-commerce are discussed. Section 3 introduces the architecture of semantic e-commerce application. Finally the conclusion is given.

2. Related Terminology:

2.1. E-Commerce:

E-commerce (also written as e-Commerce, eCommerce or similar variants), short for electronic commerce, is trading in products or services using computer networks, such as the Internet. Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems. Modern electronic commerce typically uses the World Wide Web for at least one part of the transaction's life cycle, although it may also use other technologies such as e-mail. There are two major types emerged like Business-to-Consumer (B2C), and Business-to Business (B2B) e-commerce models.

The *Business-to-Consumer (B2C)* e-commerce model is a publicly accessible Web site offering products for sale to the customers. The *Business-to-Business (B2B)* e-commerce model specifically designed for organizations to conduct business over the Internet. In this paper we are concentrating only on B2C ecommerce.

Current E-Commerce: A search for any product or product offers is the starting point for most e-Commerce transactions. E-Commerce web applications are designed to return the most appropriate data to the user but the current applications are failing in returning the relevant data to the consumers.

2.2. Semantic Web:

The Semantic Web is an extension of the Web through standards by the World Wide Web Consortium (W3C). The standards promote common data formats and exchange protocols on the Web, most fundamentally the Resource Description Framework (RDF).

The initiation for the Semantic Web was by Sir Tim Berners Lee, who is the famous inventor of WWW and one of the W3C directors. Semantic Web is an extension of the current web, in which the semantics of information and the services of the web is defined, making it possible for the web to understand and satisfy the requirements of the people to use the web content. With a Semantic Web, we can easily handle many issues, like knowledge-repository, search agent, information parser, etc., which cannot be done well with the current web. To make the web semantic, we need new standard web ontology languages. Ontology is a key to the Semantic Web.

Ontology's are used to express information in a machine interpretable form.

2.2.1 Ontology:

Ontology is a set of specifications, relationships and constraints that describe a certain domain. It defines the common terms needed to share information relevant to that domain. Ontology plays the key role in agent communication as it improves the accuracy of searching and enables the development of powerful applications that tackle complicated questions, whose answers do not reside on a single web page.

Some basic ontology languages are RDF (Resource Description Framework) and OWL (Web Ontology Language).

RDF (Resource Description Framework): RDF is a language for expressing data models in XML syntax. XML provides an elemental syntax to structure the data. It provides the meaning to that structured data. RDF is used to describe web resources. RDF assertion consists of a triplet (subject, predicate, object) in which a subject has a property that property value can be either a string literal or a reference to another resource.

For example: Let us consider the Car and its Properties.

The mileage of the car is 15 kmph (or)

The color of the car is gray.

Here, the **subject** is car

The **predicates** can be either mileage or color.

And the objects can be are 15kmph or gray.

OWL (Web Ontology Language): The Web Ontology Language (OWL) is a family of knowledge representation languages for

authoring ontologies. Ontologies are a formal way to describe taxonomies and classification networks, essentially defining the structure of knowledge for various domains: the nouns representing classes of objects and the verbs representing relations between the objects.

Limitations of Current E-Commerce are:

Information Asymmetry & Price Dispersion:

This situation occurs where the same product with same features is available with different price values in different websites to the consumers.

Semantic Description & Extension is Deficient:

This situation occurs where the product's generic attributes are not considered, such as price, color, function, origin and material etc.

Business Attributes: This situation occurs where the customers choose the tax percentage, type of pay and discount offered if any etc.

Interoperability in an inconsistent environment:

This situation occurs where the consumer is in the conflicting state to choose the best option from the available websites.

For example: Let's take a case of specific search for mobile phone having camera and ability to download ringtones from email.

Case1: In current web search, it will not certainly return a list containing all mobile phones with a camera, email function and the ability to download ring tones. It may either display the list of mobiles with camera and also without camera or else it simply displays

about either only different camera models or different ring tones.

Case2: we have several websites that sell the same product at different prices. A consumer, who is new to online purchasing will default opts the Amazon site and buy the product for Rs. 5000/- A consumer who has much experience in online purchasing will search various web sites and finally gets the product for Rs. 3000/-. So the total savings for the experienced consumer is Rs. 1000/-. Hence there is a significant gain due to the information asymmetry, this is price dispersion. If we spend much time for the search we can buy the better product.

3. SEMANTIC WEB E-COMMERCE ARCHITECTURE

In the previous section we have explained the current ecommerce and its drawbacks and also stated that the Semantic web application can overcome these drawbacks. Fig.1 shows the architecture of the semantic web based e-commerce application.

Here, Producer is the one, who manufactures the products and concentrates on the quality and efficiency of the particular product and advertise the details in the web market. Consumer is an individual who buys products or services for personal use over the internet. Agents are meant to reduce the consumers work and information overload. In the increasing growth of e-commerce technology, services and information available on the internet, agents plays a very important role. Agents are active, autonomous and personalized software's to which tasks can be delegated.

In architecture, we have two types of agents.

1. Search agent
2. Ontology agent

The consumer directly communicates with search agent, who is responsible for retrieving the metadata of documents. Here we used the SPARQL query language to retrieve the related information to the consumers. The Producer communicates with ontology agent, who provides the knowledge of ontology to answer queries about the domain and its structure. Here we use the Jena framework to build the ontology like RDF.

From the architecture it has shown that, any product or service should be described ontologically to retrieve the result in semantic manner. For example, the mobile company provides the related terms and structures related to that domain and the mobile database to the agent. The agent generates the RDF. Whenever the consumer or user want to search the information that information is passed to the search agent; the search agent searches the related information using SPARQL query language.

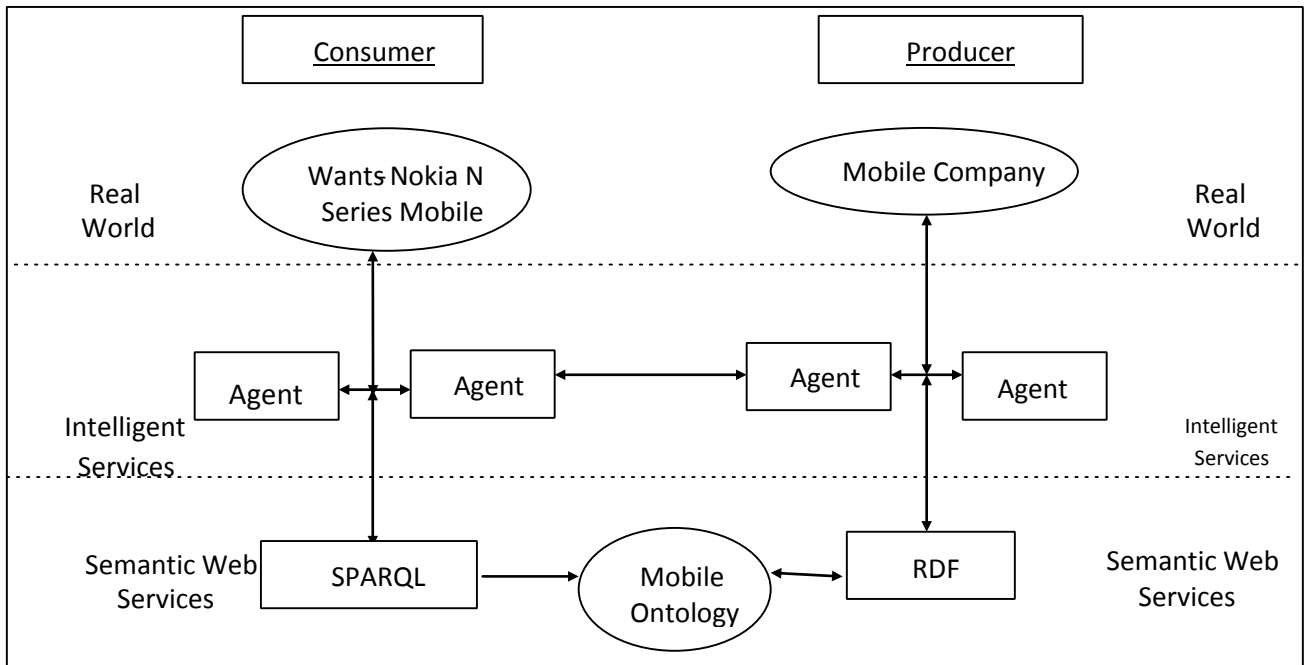


Fig1: Architecture of Semantic Web E-Commerce

4. Conclusion:

There is a great demand for retrieving and sharing the information across the internet in an efficient way. Semantic web and software agents are providing direction in this regard. This paper introduces a semantic web based e-commerce application which is suitable for retrieving the data without inconsistency of data. Semantic web technology also offers various services like automatic producer recognition, automatic product and service recognition and in price and quality comparisons.

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